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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Roland A. Wood
Title: IMPROVED BOLOMETER OPERATION USING FAST SCANNING

Docket No.: H0001512 (256.087US1)
Filed: March 6, 2001
Examiner: Shun K Lee

Serial No.: 09/800,366
Due Date: July 27, 2004
Group Art Unit: 2878

Appeal Brief--Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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(GENERAL)

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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	)	
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APPELLANTS' BRIEF ON APPEAL

Mail Stop Appeal Brief- Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

The Appeal Brief is presented in support of the Notice of Appeal to the Board of Patent Appeals and Interferences, filed on May 27, 2004, from the Final Rejection of claims 1-27 and 29-39 of the above-identified application, as set forth in the Final Office Action mailed on December 31, 2003.

This Appeal Brief is filed in triplicate. The Commissioner of Patents and Trademarks is hereby authorized to charge Deposit Account No. 19-0743 in the amount of 330.00 which represents the requisite fee set forth in 37 C.F.R. § 117. The Appellants respectfully request consideration and reversal of the Examiner's rejections of pending claims.

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APPELLANTS' BRIEF ON APPEAL

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APPENDIX I-The Claims on Appeal 23

1. REAL PARTY IN INTEREST

The real party in interest of the above-captioned patent application is the assignee, HONEYWELL INTERNATIONAL INC.

2. RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to Appellant that will have a bearing on the Board's decision in the present appeal.

3. STATUS OF THE CLAIMS

Claims 1-27 and 29-39 are pending in the application and have all been finally rejected. The rejected claims 1-27 and 29-39 are the subject of the present appeal.

4. STATUS OF AMENDMENTS

No amendments have been made subsequent to the Response, filed March 1, 2004, to the Final Office Action mailed to the Appellants on January 12, 2004.

5. SUMMARY OF THE INVENTION

A method and apparatus applies two or more bias pulses substantially sequentially to each of the one or more microbolometers in an array such that the resulting temperature in each of the microbolometers is substantially uniform during a frame time, and measure two or more resulting signals associated with each of the applied two or more bias pulses during the frame time. Further, computing an average signal value from the measured two or more resulting signals for each of the microbolometers in the array during the frame time. Thereafter, producing an output signal based on the computed average signal value to improve performance, sensitivity, and facility of operation of the array.

In the drawings Figure 5 is a graph 500 illustrating one embodiment of operating each of the microbolometers in the array. Instead of a single bias pulse 430 applied in the prior art (see Figure 4), a series of two or more bias pulses 510 are applied substantially sequentially to each microbolometer in the array 110 within the frame time 410. The application of one or more bias pulses 510 to each of the microbolometers within the frame time 410 is to as "fast scanning." Assuming an array size of 'R x C', and a frame time of 'T', each microbolometer in the array 110 could receive two or more bias pulses 510 having a time duration not exceeding (T/(N x R x C)) within the frame time 410. Alternatively, several microbolometers could be simultaneously provided with two or more bias pulses 510.

Embodiments may improve performance sensitivity and facility of operation of an array including one or more microbolometers. In independent claim 1, two or more bias pulses are applied substantially sequentially during a frame time to each microbolometer in the array. Two or more resulting signals are measured corresponding to the two or more bias pulses. An average signal value is computed from the two or more resulting signals corresponding to each microbolometer in the array during the frame time, and an output signal is produced based on the computed average signal value for each microbolometer in the array during the frame time.

6. ISSUES PRESENTED FOR REVIEW

Whether claims 1, 2, 7, 9-17, 20 and 22-26 were rejected under 35 USC § 102(b) as being anticipated by Wood et al (U.S. Patent No. 5,675,149) and incorporated by reference Wood (U.S. Patent No. 5,420,419).

Whether claims 3-5 are unpatentable under 35 USC § 103(a) over Wood et al.(U.S. Patent No. 5,675,149) and incorporated by Wood (U.S. Patent No. 5,420,419) in view of Applicant's Admitted Prior Art.

Whether claim 6 is unpatentable under 35 USC § 103(a) over Wood et al.(U.S. Patent No. 5,675,149) and incorporated by Wood (U.S. Patent No. 5,420,419) in view of Applicant's Admitted Prior Art as applied to claim 5 above, and further in view of Thiede et al. (U.S. Patent No. 5,129,595).

Whether claims 8, 21, 27, 29, and 33-39 are unpatentable under 35 USC § 103(a) over Wood et al.(U.S. Patent No. 5,675,149) and incorporated by reference Wood (U.S. Patent No. 5,420,419) in view of Duvall, III (U.S. Patent No. 5,258,619).

Whether claims 18 and 19 are unpatentable under 35 USC § 103(a) over Wood et al.(U.S. Patent No. 5,675,149) and incorporated by Wood (U.S. Patent No. 5,420,419) in view of Thiede et al. (U.S. Patent No. 5,129,595).

Whether claims 30-32 are unpatentable under 35 USC § 103(a) over Wood et al.(U.S. Patent No. 5,675,149) and incorporated by Wood (U.S. Patent No. 5,420,419) in view Duvall, III as applied to claim 29 above, and further in view of Thiede et al.

7. GROUPING OF CLAIMS

Claims 1-7 are grouped together and argued separately.

Claims 8-12 are grouped together and argued separately.

Claim 13 stands alone and is argued separately.

Claims 14-19 are grouped together and argued separately.

Claims 20-25 are grouped together and argued separately.

Claim 26 stands alone and is argued separately.

Claims 27, 29-32 are grouped together and argued separately.

Claims 33-38 are grouped together and argued separately.

Claim 39 stands alone and is argued separately.

8. ARGUMENT

1) The Claim Rejections

Claims 1, 2, 7, 9-17, 20 and 22-26 were rejected under 35 USC § 102(b) as being anticipated by Wood et al (U.S. Patent No. 5,675,149) and incorporated by reference Wood (U.S. Patent No. 5,420,419). It should be noted that Mr. Wood, the inventor on the present application, and an inventor or co-inventor on the cited Wood and Wood et al., references is the same person. The currently claimed invention is an improvement on his

previous work. The combination of references does not teach or suggest each and every element of the claimed invention.

Claims 3-5 were rejected under 35 USC § 103(a) as being unpatentable over Wood et al.(U.S. Patent No. 5,675,149) and incorporated by Wood (U.S. Patent No. 5,420,419) in view of Applicant's Admitted Prior Art.

Claim 6 was rejected under 35 USC § 103(a) as being unpatentable over Wood et al.(U.S. Patent No. 5,675,149) and incorporated by Wood (U.S. Patent No. 5,420,419) in view of Applicant's Admitted Prior Art as applied to claim 5 above, and further in view of Thiede et al. (U.S. Patent No. 5,129,595).

Claims 8, 21, 27, 29, and 33-39 were rejected under 35 USC § 103(a) as being unpatentable over Wood et al.(U.S. Patent No. 5,675,149) and incorporated by reference Wood (U.S. Patent No. 5,420,419) in view of Duvall, III (U.S. Patent No. 5,258,619).

Claims 18 and 19 was rejected under 35 USC § 103(a) as being unpatentable over Wood et al.(U.S. Patent No. 5,675,149) and incorporated by Wood (U.S. Patent No. 5,420,419) in view of Thiede et al. (U.S. Patent No. 5,129,595).

Claims 30-32 was rejected under 35 USC § 103(a) as being unpatentable over Wood et al.(U.S. Patent No. 5,675,149) and incorporated by Wood (U.S. Patent No. 5,420,419) in view Duvall, III as applied to claim 29 above, and further in view of Thiede et al.

It is to be noted that in the Response to the Final Office Action claims 15 and 29 were amended consistent with the recommendation of the Examiner, and the specification was also amended consistent with the suggestion of the Examiner to overcome objections to the specification and claims.

2) *The Applicable Law under 35 U.S.C. § 102(b)*

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *M.P.E.P. ' 2131*. To anticipate a claim, a reference must disclose every element of the challenged claim and enable one skilled in the art to make the anticipating subject matter. *PPG Industries, Inc. V. Guardian Industries Corp.*, 75 F.3d 1558, 37 USPQ2d 1618 (Fed. Cir. 1996). The identical invention must be shown in as complete detail as is contained in the

claim. *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

3) The Applicable Law under 35 U.S.C. § 103

The Examiner has the burden under 35 U.S.C. 103 to establish a *prima facie* case of obviousness. *In re Fine*, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). As part of establishing a *prima facie* case of obviousness, the Examiner must show that some objective teaching in the prior art or some knowledge generally available to one of ordinary skill in the art would lead an individual to combine the relevant teaching of the references. *Id.*

The court in *Fine* stated that:

> Obviousness is tested by "what the combined teaching of the references would have suggested to those of ordinary skill in the art." *In re Keller*, 642 F.2d 413, 425, 208 USPQ 871, 878 (CCPA 1981)). But it "cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination." *ACS Hosp. Sys.*, 732 F.2d at 1577, 221 USPQ at 933. And "teachings of references can be combined *only* if there is some suggestion or incentive to do so." *Id.* (emphasis in original).
>
> The M.P.E.P. adopts this line of reasoning, stating that
> "In order for the Examiner to establish a *prima facie* case of obviousness, three base criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on Appellant s disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed.Cir. 1991))". *M.P.E.P.* 2142

The test for obviousness under § 103 must take into consideration the invention as a whole; that is, one must consider the particular problem solved by the combination of elements that define the invention. *Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 1143, 227 USPQ 543, 551 (Fed. Cir. 1985). The Examiner must, as one of the inquiries pertinent to any obviousness inquiry under 35 U.S.C. § 103, recognize and consider not only the similarities but also the critical differences between the claimed invention and

the prior art. *In re Bond*, 910 F.2d 831, 834, 15 USPQ2d 1566, 1568 (Fed. Cir. 1990), *reh'g denied*, 1990 U.S. App. LEXIS 19971 (Fed. Cir. 1990). Finally, the Examiner must avoid hindsight. *Id.*

Anticipation via a single prior art reference requires the disclosure in the reference of each element of the claim under consideration. *In re Dillon* 919 F.2d 688, 16 USPQ2d 1897, 1908 (Fed. Cir. 1990) (en banc), cert. denied, 500 U.S. 904 (1991).

4) General Discussion of the Rejection of the Claims under 35 U.S.C. § 102(b) as being anticipated by Wood et al. (U.S. Patent No. 5,675,149) and incorporated by reference Wood (U.S. Patent No. 5,420,419)

During prosecution, Applicant argued for patentability of the pending claims because the references do not teach or suggest the use of two bias pulses in a time frame as claimed, as well as further elements referencing the use of two or more bias pulses.

As explained in the responses during prosecution, Wood in FIG. 6 and in col. 6, lines 18-26 describes applying a single bias pulse to each microbolometer in each frame time. Further, Wood in claim 19, lines 22-24 describes sweeping the receiving units (i.e., microbolometers in the array) with a single pulse (i.e., a 5 microsecond bias pulse) of short duration, in relation to the time required to sweep said array (i.e., 80,000 pixel array). Using a 5 microsecond bias pulse per microbolometer in an 80,000 pixel array and addressing 14 pixels at a time in the array results in a frame time of approximately about 1/30th of a second, which is about a typical frame time required to scan an infrared image. In contrast, the claimed embodiments of the present application recite "to apply two or more bias pulses substantially sequentially to each microbolometer in the array during a frame time". Wood does not teach applying two or more bias pulses substantially sequentially to each microbolometer in the array during a frame time. In contrast, Wood describes applying a single, 5 microsecond, bias pulse to each microbolometer in an, 80,000 microbolometer, array.

Wood et al. in col. 5, lines 17-23 and lines 53-55 describe scan times (i.e., frame time) of not more than 1 second. In addition, Wood et al. in col. 5, lines 40-47 describe scanning using a moveable board and then measuring signals from individual pixels and do not describe applying two or more bias pulses to each of the microbolometers as

recited in the claims of the present application. Further, Wood et al. in col. 5, lines 47-53 describe performing multiple scans of any desired region of a scene and do not describe application of two or more bias pulses substantially sequentially to each microbolometer in the array in each frame time (i.e., each scan) as recited in the claims. Furthermore, Wood et al. in col.5, lines 47-53 describe averaging of the signals obtained in multiple scans of any desired region of the scene and do not describe measuring the two or more signals associated with each of the applied two or more bias pulses during a frame time as recited in the claims.

Applicant further addresses the Examiner's rejections as follows. Each of the pending claims references the use of two or more bias pulses during a frame time. The Examiner cited Wood '419 as showing a timing circuit coupled to the array to apply (US 5,420,419 column 6, lines 18-34) two or more bias pulses substantially sequentially to each microbolometer in the array during a frame time (i.e., the exposure time for producing a complete image; column 5, lines 47-53). However, no such teaching is identified in those referenced sections of Wood '419. Column 6, lines 18-34 discusses a temperature curve corresponding to current pulses. It does not contain any reference to multiple bias pulses during a frame time. Column 5, lines 47-53 simply describes a focal plane array with inputs and outputs. Again, no reference to multiple bias pulses during a time frame was found.

Even if the Examiner meant to refer to column 3, lines 40-54, it only refers to providing offset correction by averaging several image frames in an image processor 80. The Examiner appears to be stating that such averaging is the same as averaging pulses within a single frame time. Nowhere does Wood '419 or Wood et al. teach or suggest utilizing two or more bias pulses during a frame time. Wood '419 does not refer to the average of several image frames as a "complete image" as coined by the Examiner in the rejection. In fact, Wood '419 refers to them as stored "digital data in a long-lived digital memory" at line 43. "The image processor subtracts the incoming signals from the digital data in its long-lived memory on a pixel-by-pixel basis. This provides offset correction for each pixel in the image to be viewed by a human observer,...", lines 49-53. Since the iris is closed, or a lens cap is used, no "complete image" is produced by such

averaging as alleged in the Office Action. Further, it is quite clear that neither Wood reference applies multiple bias pulses during a frame time as claimed.

In the May 27, 2004 response to the Final Rejection, Applicant argued that the cited references do not describe the claimed use of two or more bias pulses during a frame time and cited U.S. Patent 5,420,419 column 3, lines 40-54. However, in the Advisory Action the Examiner disagreed.

U.S. Patent 5,420,419 column 3, lines 40-54 states: "The iris may be closed momentarily (e.g., after camera manufacture, or at camera start-up) to allow the image processor 80 to average several image frames and store this digital data in a long-lived digital memory (which may be in the image processor systems). A simple expedient of a lens cap or shutter may be employed instead, if desired. During normal camera operation the iris 72 remains permanently open, or partially closed if it is desired to reduce the radiation intensity falling on the focal plane. The image processor subtracts the incoming signals from the digital data in its long-lived memory on a pixel-by-pixel basis. This provides offset correction for each pixel in the image to be viewed by a human observer, a requirement and process well known to those in the art".

In the Advisory Action the Examiner concluded that it is clear that the passage cited by Applicant relates to obtaining correction data using a process well known to those in the art. The Examiner further states that US Patent 5,420,419 (Wood) Fig. 6 illustrates the effect of the application of pulse bias voltage (two are shown) to the passive elements of the focal plane array over time (see also US 5,420,419 column 6, lines 18-34) and US Patent 5,675,149 (Wood et at.) column 5, lines 47-53 states "if desired, slower slide velocities, or multiple scans of any desired region of the scene, can be employed to allow sensitivity improvement by multiple measurement and averaging of sensor signals: in this case, a stable platform for example, a tripod mounting of the camera may be required, analogous to long exposures of visible photographic still frame cameras". The Examiner further concludes: "Thus analogous to long exposures of visible photographic still frame cameras, each scan of multiple scans have a pulse bias voltage applied to the focal plane array passive elements wherein the resulting multiple sensor signal measurements are then averaged. Therefore during the exposure time for producing a complete image (i.e., the frame time), the complete image was produced

from an average of multiple sensor signal measurements wherein each measurement was obtained by the application of a pulse bias voltage to the focal plane array passive elements."

However, as previously explained, this clearly does not anticipate the claimed embodiments of present application. The prior art references to not disclose or suggest the application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time, nor measuring the two or more signals associated with each of the applied two or more bias pulses during a frame time.

5) Discussion of the Rejection of Each of the Claims Under 35 U.S.C. § 102 and Under 35 U.S.C. § 103

Independent claim 1 is directed to a method for improving performance sensitivity and facility of operation of an array including one or more microbolometers, comprising: applying two or more bias pulses substantially sequentially during a frame time to each microbolometer in the array; measuring two or more resulting signals corresponding to the two or more bias pulses; computing an average signal value from the two or more resulting signals corresponding to each microbolometer in the array during the frame time; and producing an output signal based on the computed average signal value for each microbolometer in the array during the frame time. However, as previously explained, the prior art references to not disclose or suggest the application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time, nor the measurement of two or more signals associated with each of the applied two or more bias pulses during a frame time. Therefore, claim 1 is believed to be allowable for the reasons set forth above.

Dependent claim 2, which is dependent on claim 1, further claims repeating the applying, measuring, computing, and producing steps to compute output signals during each frame time. Claim 2 is believed to be allowable for all the reasons argued with respect to claim 1. Especially in regards to the application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time.

Dependent claim 3, which is dependent on claim 2, further claims applying a corrective electrical signal to the output signal to correct for resistance non-uniformity

between the one or more microbolometers in the array to obtain a substantially uniform output signal value. Additionally, in rejecting claim 3, the Examiner stated that Applicant admits (first paragraph on pg. 6) it is known in the art (such as US Patent 4,752,694) to apply a corrective electrical signal to the output signal to correct for resistance non-uniformity between the one or more microbolometers of the array (ie., "coarse non-uniforinity correction") to obtain a substantially uniform output signal value. The Examiner then concluded that it would have been obvious to one having ordinary skill in the art to apply a corrective electrical signal in the method of Wood et al., in order to obtain a substantially uniform output signal value. However, there is no discussion in the reference of application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time, which has not been anticipated by either of the Wood references. Applicant believes that claim 3 is in condition for allowance and respectfully requests the withdrawal of all rejections.

Dependent claim 4, which is dependent on claim 3, further claims converting the substantially uniform output signal value associated with each microbolometer in the array to a digital signal value. Additionally, in rejecting claim 4, the Examiner stated that Wood et al. also disclose (column 2, lines 57-59) an integrator (integrating preamplifiers 26) and an A/D converter (32) to converting the substantially uniform output signal associated with each microbolometer to a digital signal value. However, there is no discussion in the reference of application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time, which has not been anticipated by either of the Wood references. Applicant believes that claim 4 is in condition for allowance and respectfully requests the withdrawal of all rejections.

Dependent claim 5, which is dependent on claim 4, further claims passing the digital signal value associated with each microbolometer in the array through a digital image processor to correct for image defects. Additionally, in rejecting claim 5, the Examiner stated that Wood et al. also disclose (column 4, lines 5-24) passing the digital signal values associated with each microbolometer in the array through a digital image processor to correct for image defects. However, there is no discussion in the reference of application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time, which has not been disclosed by either of the Wood

references. Applicant believes that claim 5 is in condition for allowance and respectfully requests the withdrawal of all rejections.

Dependent claim 6, which is dependent on claim 5, further claims image defects selected from the group consisting of fine offsets, gain non-uniformity, and dead pixels. Additionally, in rejecting claim 6, the Examiner cited Thiede et al. as teaching (column 7, lines 45-66) the correction of gain non-uniformity and dead pixels in order to fully compensate for array non-uniformity. However, the language cited does not teach an application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time, which has not been disclosed by either of the Wood references. Applicant believes that claim 6 is in condition for allowance and respectfully requests the withdrawal of all rejections.

Dependent claim 7, which is dependent on claim 1, further claims the bias pulses being substantially equal in magnitude. Claim 7 is believed to be allowable for all the reasons argued with respect to claim 1. Especially in regards to the application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time.

Dependent claim 8, which is dependent on claim 1, further claims the bias pulses being substantially equally spaced in time. Additionally, in rejecting claim 8, the Examiner cited Duvall, III as teaching (column 6, lines 43-53) that a swept bias technique includes adjusting the waveform parameters of rise-time, fall-time, peak to peak values, time between pulses, pulse slope, pulse width, and pulse amplitude which best meets a given detector and design situation in order to minimize unwanted detector heating. However, the language cited does not teach an application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time, which has not been disclosed by either of the Wood references. Applicant believes that claim 8 is in condition for allowance and respectfully requests the withdrawal of all rejections.

Dependent claim 9, which is dependent on claim 1, further claims the two or more bias pulses comprising two or more voltage bias pulses. Claim 9 is believed to be allowable for all the reasons argued with respect to claim 1. Especially in regards to the application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time.

Dependent claim 10, which is dependent on claim 10, further claims the two or more resulting signals comprising two or more current signals. Claim 10 is believed to be allowable for all the reasons argued with respect to claim 1. Especially in regards to the application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time.

Dependent claim 11, which is dependent on claim 1, further claims the bias pulses being in the range of about 2 to 100 bias pulses. Claim 11 is believed to be allowable for all the reasons argued with respect to claim 1. Especially in regards to the application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time.

Dependent claim 12, which is dependent on claim 1, further claims each of the two or more bias pulses having a time duration in the range of about 0.1 to 20 microseconds. Claim 12 is believed to be allowable for all the reasons argued with respect to claim 1. Especially in regards to the application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time.

Dependent claim 13, which is dependent on claim 1, further claims the frame time being the time it takes for the array to produce a complete image of an object being viewed by the array. Claim 13 is believed to be allowable for all the reasons argued with respect to claim 1. Especially in regards to the application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time.

Independent claim 14 is directed to an infrared radiation detector apparatus, comprising: microbolometers in an array; a timing circuit coupled to the array to apply two or more bias pulses substantially sequentially to each microbolometer in the array during a frame time; a measuring circuit coupled to the array to measure two or more resulting signals associated with each of the applied two or more bias pulses during the frame time; a computing circuit coupled to the measuring circuit to compute an average signal value for each microbolometer in the array from the measured two or more resulting signals during the frame time; and an output circuit coupled to the computing circuit to produce an output signal based on the computed average signal value for each microbolometer in the array during the frame time. However, as previously explained, the prior art references to not disclose or suggest the application of two or more bias pulses

substantially sequentially to each microbolometer in an array in each frame time, nor the measurement of two or more signals associated with each of the applied two or more bias pulses during a frame time. Therefore, claim 14 is believed to be allowable for the reasons set forth above.

Dependent claim 15, which is dependent on claim 14, further claims an integrator and an A/D converter wherein said output signal produced is a digital signal value for each microbolometer in the array. Claim 15 is believed to be allowable for all the reasons argued with respect to claim 14. Especially in regards to the application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time.

Dependent claim 16, which is dependent on claim 15, further claims a digital image processor, coupled to the output circuit to receive the digital signal value associated with each microbolometer of the array and to correct the received digital signal value for image defects. Claim 16 is believed to be allowable for all the reasons argued with respect to claim 14. Especially in regards to the application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time.

Dependent claim 17, which is dependent on claim 16, further claims a correction circuit, to apply a corrective electrical signal based on a correction value to the output signal to correct for resistance non-uniformity in each microbolometer to obtain a uniform output signal value. Claim 17 is believed to be allowable for all the reasons argued with respect to claim 14. Especially in regards to the application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time.

Dependent claim 18, which is dependent on claim 17, further claims the correction circuit further correcting the uniform output signal value for fine offsets, gain non-uniformity, or dead pixels. Additionally, in rejecting claim 18, the Examiner cited Thiede et al. as teaching (column 7, lines 45-66) the correction of gain non-uniformity and dead pixels in order to fully compensate for array non-uniformity. However, the language cited does not teach an application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time, which has not been

disclosed by either of the Wood references. Applicant believes that claim 18 is in condition for allowance and respectfully requests the withdrawal of all rejections.

Dependent claim 19, which is dependent on claim 18, further claims digital memories to store the correction values for each microbolometer in the array. Additionally, in rejecting claim 19, the Examiner cited Thiede et al. as teaching (column 7, lines 45-66) the correction of gain non-uniformity and dead pixels in order to fully compensate for array non-uniformity. However, the language cited does not teach an application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time, which has not been disclosed by either of the Wood references. Applicant believes that claim 19 is in condition for allowance and respectfully requests the withdrawal of all rejections.

Dependent claim 20, which is dependent on claim 14, further claims the two or more bias pulses being substantially equal in magnitude. Claim 20 is believed to be allowable for all the reasons argued with respect to claim 14. Especially in regards to the application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time.

Dependent claim 21, which is dependent on claim 20, further claims the two or more bias pulses being substantially equally spaced in time. Additionally, in rejecting claim 21, the Examiner cited Duvall, III as teaching (column 6, lines 43-53) that a swept bias technique includes adjusting the waveform parameters of rise-time, fall-time, peak to peak values, time between pulses, pulse slope, pulse width, and pulse amplitude which best meets a given detector and design situation in order to minimize unwanted detector heating. However, the language cited does not teach an application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time, which has not been disclosed by either of the Wood references. Applicant believes that claim 21 is in condition for allowance and respectfully requests the withdrawal of all rejections.

Dependent claim 22, which is dependent on claim 14, further claims the two or more bias pulses being voltage bias pulses. Claim 22 is believed to be allowable for all the reasons argued with respect to claim 14. Especially in regards to the application of

two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time.

Dependent claim 23, which is dependent on claim 22, further claims the resulting signals being current signals. Claim 23 is believed to be allowable for all the reasons argued with respect to claim 14. Especially in regards to the application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time.

Dependent claim 24, which is dependent on claim 14, further claims the two or more bias pulses being in the range of about 2 to 100 bias pulses. Claim 24 is believed to be allowable for all the reasons argued with respect to claim 14. Especially in regards to the application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time.

Dependent claim 25, which is dependent on claim 24, further claims the two or more bias pulses having time duration in the range of about 0.1 to 20 microseconds. Claim 25 is believed to be allowable for all the reasons argued with respect to claim 14. Especially in regards to the application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time.

Dependent claim 26, which is dependent on claim 14, further claims the frame time being the time it takes for the array to produce a complete image of an object being viewed by the array. Claim 26 is believed to be allowable for all the reasons argued with respect to claim 14. Especially in regards to the application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time.

Independent claim 27 is directed to a signal processing electronics circuit for an array including one or more microbolometers, comprising: a timing circuit coupled to the array to apply two or more bias pulses substantially sequentially to each microbolometer in the array such that the resulting temperature in each microbolometer in the array due to the application of the bias pulses is substantially uniform during a frame time; a measuring circuit coupled to the array to measure two or more resulting signals, respectively associated with each of the applied bias pulses during the frame time; a computing circuit coupled to the measuring circuit to compute an average signal value for each microbolometer in the array from the measured resulting signals during the frame

time; and an output circuit coupled to the computing circuit to produce an output signal based on the computed average signal value for each microbolometer in the array during the frame time.

Dependent claim 29, which is dependent on claim 27, further claims the output circuit further comprising an integrator and an A/D converter wherein said output signal produced is a digital signal value for each microbolometer in the array. Additionally, in rejecting claim 29, the Examiner cited Duvall, III as teaching (column 6, lines 43-53) that a swept bias technique includes adjusting the waveform parameters of rise-time, fall-time, peak to peak values, time between pulses, pulse slope, pulse width, and pulse amplitude which best meets a given detector and design situation in order to minimize unwanted detector heating. However, the language cited does not teach an application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time, which has not been disclosed by either of the Wood references. Applicant believes that claim 29 is in condition for allowance and respectfully requests the withdrawal of all rejections.

Dependent claim 30, which is dependent on claim 29, further claims a digital image processor coupled to the output circuit to receive the digital signal value associated with each microbolometer to correct for image defects such as fine offsets, gain non-uniformity or dead pixels. Additionally, in rejecting claim 30, the Examiner cited Thiede et al. as teaching (column 7, lines 45-66) the correction of gain non-uniformity and dead pixels in order to fully compensate for array non-uniformity. Also, the Examiner cited Duvall, III as teaching (column 6, lines 43-53) that a swept bias technique includes adjusting the waveform parameters of rise-time, fall-time, peak to peak values, time between pulses, pulse slope, pulse width, and pulse amplitude which best meets a given detector and design situation in order to minimize unwanted detector heating. However, the language cited does not teach an application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time, which has not been disclosed by either of the Wood references. Applicant believes that claim 30 is in condition for allowance and respectfully requests the withdrawal of all rejections.

Dependent claim 31, which is dependent on claim 30, further claims a correction circuit to apply a corrective electrical signal based on a correction value to the output

signal to correct for any resistance non-uniformity in each microbolometer to obtain a uniform output signal value. Additionally, in rejecting claim 31, the Examiner cited Thiede et al. as teaching (column 7, lines 45-66) the correction of gain non-uniformity and dead pixels in order to fully compensate for array non-uniformity. Also, the Examiner cited Duvall, III as teaching (column 6, lines 43-53) that a swept bias technique includes adjusting the waveform parameters of rise-time, fall-time, peak to peak values, time between pulses, pulse slope, pulse width, and pulse amplitude which best meets a given detector and design situation in order to minimize unwanted detector heating. However, the language cited does not teach an application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time, which has not been disclosed by either of the Wood references. Applicant believes that claim 31 is in condition for allowance and respectfully requests the withdrawal of all rejections.

Dependent claim 32, which is dependent on claim 31, further claims a memory to store the correction value associated with each microbolometer in the array. Additionally, in rejecting claim 32, the Examiner cited Thiede et al. as teaching (column 7, lines 45-66) the correction of gain non-uniformity and dead pixels in order to fully compensate for array non-uniformity. Also, the Examiner cited Duvall, III as teaching (column 6, lines 43-53) that a swept bias technique includes adjusting the waveform parameters of rise-time, fall-time, peak to peak values, time between pulses, pulse slope, pulse width, and pulse amplitude which best meets a given detector and design situation in order to minimize unwanted detector heating. However, the language cited does not teach an application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time, which has not been disclosed by either of the Wood references. Applicant believes that claim 32 is in condition for allowance and respectfully requests the withdrawal of all rejections.

Dependent claim 33, which is dependent on claim 31, further claims the two or more bias pulses being substantially equal in magnitude. Additionally, in rejecting claim 33, the Examiner cited Duvall, III as teaching (column 6, lines 43-53) that a swept bias technique includes adjusting the waveform parameters of rise-time, fall-time, peak to peak values, time between pulses, pulse slope, pulse width, and pulse amplitude which best meets a given detector and design situation in order to minimize unwanted detector

heating. However, the language cited does not teach an application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time, which has not been disclosed by either of the Wood references. Applicant believes that claim 33 is in condition for allowance and respectfully requests the withdrawal of all rejections.

Dependent claim 34, which is dependent on claim 33, further claims the two or more bias pulses being substantially equally spaced in time. Additionally, in rejecting claim 34, the Examiner cited Duvall, III as teaching (column 6, lines 43-53) that a swept bias technique includes adjusting the waveform parameters of rise-time, fall-time, peak to peak values, time between pulses, pulse slope, pulse width, and pulse amplitude which best meets a given detector and design situation in order to minimize unwanted detector heating. However, the language cited does not teach an application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time, which has not been disclosed by either of the Wood references. Applicant believes that claim 34 is in condition for allowance and respectfully requests the withdrawal of all rejections.

Dependent claim 35, which is dependent on claim 27, further claims the two or more bias pulses being voltage bias pulses. Additionally, in rejecting claim 35, the Examiner cited Duvall, III as teaching (column 6, lines 43-53) that a swept bias technique includes adjusting the waveform parameters of rise-time, fall-time, peak to peak values, time between pulses, pulse slope, pulse width, and pulse amplitude which best meets a given detector and design situation in order to minimize unwanted detector heating. However, the language cited does not teach an application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time, which has not been disclosed by either of the Wood references. Applicant believes that claim 35 is in condition for allowance and respectfully requests the withdrawal of all rejections.

Dependent claim 36, which is dependent on claim 35, further claims the resulting signals being current signals. Additionally, in rejecting claim 36, the Examiner cited Duvall, III as teaching (column 6, lines 43-53) that a swept bias technique includes adjusting the waveform parameters of rise-time, fall-time, peak to peak values, time between pulses, pulse slope, pulse width, and pulse amplitude which best meets a given

detector and design situation in order to minimize unwanted detector heating. However, the language cited does not teach an application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time, which has not been disclosed by either of the Wood references. Applicant believes that claim 36 is in condition for allowance and respectfully requests the withdrawal of all rejections.

Dependent claim 37, which is dependent on claim 27, further claims the two or more bias pulses being in the range of about 2 to 100 bias pulses. Additionally, in rejecting claim 37, the Examiner cited Duvall, III as teaching (column 6, lines 43-53) that a swept bias technique includes adjusting the waveform parameters of rise-time, fall-time, peak to peak values, time between pulses, pulse slope, pulse width, and pulse amplitude which best meets a given detector and design situation in order to minimize unwanted detector heating. However, the language cited does not teach an application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time, which has not been disclosed by either of the Wood references. Applicant believes that claim 37 is in condition for allowance and respectfully requests the withdrawal of all rejections.

Dependent claim 38, which is dependent on claim 37, further claims the two or more bias pulses having time duration in the range of about 0.1 to 20 microseconds. Additionally, in rejecting claim 38, the Examiner cited Duvall, III as teaching (column 6, lines 43-53) that a swept bias technique includes adjusting the waveform parameters of rise-time, fall-time, peak to peak values, time between pulses, pulse slope, pulse width, and pulse amplitude which best meets a given detector and design situation in order to minimize unwanted detector heating. However, the language cited does not teach an application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time, which has not been disclosed by either of the Wood references. Applicant believes that claim 38 is in condition for allowance and respectfully requests the withdrawal of all rejections.

Dependent claim 39, which is dependent on claim 27, further claims the frame time being the time it takes for the array to produce a complete image of an object being viewed by the array. Additionally, in rejecting claim 39, the Examiner cited Duvall, III as teaching (column 6, lines 43-53) that a swept bias technique includes adjusting the

waveform parameters of rise-time, fall-time, peak to peak values, time between pulses, pulse slope, pulse width, and pulse amplitude which best meets a given detector and design situation in order to minimize unwanted detector heating. However, the language cited does not teach an application of two or more bias pulses substantially sequentially to each microbolometer in an array in each frame time, which has not been disclosed by either of the Wood references. Applicant believes that claim 39 is in condition for allowance and respectfully requests the withdrawal of all rejections.

9. SUMMARY

Applicant believes the claims are in condition for allowance and requests withdrawal of the rejections to claims1-27 and 29-39. Reversal of the Examiner's rejections of claims 1-27 and 29-39 in this appeal is respectfully requested.

Respectfully submitted,

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Mail Stop Appeal Brief-Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 27 day of July, 2004.

Name Gina M. Uphus Signature Gina Uphus

APPENDIX I

The Claims on Appeal

1. (Previously Presented) A method for improving performance sensitivity and facility of operation of an array including one or more microbolometers, comprising:

applying two or more bias pulses substantially sequentially during a frame time to each microbolometer in the array;

measuring two or more resulting signals corresponding to the two or more bias pulses;

computing an average signal value from the two or more resulting signals corresponding to each microbolometer in the array during the frame time; and

producing an output signal based on the computed average signal value for each microbolometer in the array during the frame time.

2. (Previously Presented) The method of claim 1, further comprising:

repeating the applying, measuring, computing, and producing steps to compute output signals during each frame time.

3. (Previously Presented) The method of claim 2, further comprising:

applying a corrective electrical signal to the output signal to correct for resistance non-uniformity between the one or more microbolometers in the array to obtain a substantially uniform output signal value.

4. (Previously Presented) The method of claim 3, further comprising:

converting the substantially uniform output signal value associated with each microbolometer in the array to a digital signal value.

5. (Previously Presented) The method of claim 4, further comprising:

passing the digital signal value associated with each microbolometer in the array through a digital image processor to correct for image defects.

6. (Previously Presented) The method of claim 5, wherein the image defects comprises:

image defects selected from the group consisting of fine offsets, gain non-uniformity, and dead pixels.

7. (Original) The method of claim 1, wherein the bias pulses are substantially equal in magnitude.

8. (Original) The method of claim 1, wherein the bias pulses are substantially equally spaced in time.

9. (Previously Presented) The method of claim 1, wherein the two or more bias pulses comprise:

two or more voltage bias pulses.

10. (Previously Presented) The method of claim 1, wherein the two or more resulting signals comprises:

two or more current signals.

11. (Original) The method of claim 1, wherein the bias pulses are in the range of about 2 to 100 bias pulses.

12. (Original) The method of claim 1, wherein each of the two or more bias pulses has a time duration in the range of about 0.1 to 20 microseconds.

13. (Original) The method of claim 1, wherein the frame time is the time it takes for the array to produce a complete image of an object being viewed by the array.

14. (Previously Presented) An infrared radiation detector apparatus, comprising:

microbolometers in an array;

a timing circuit coupled to the array to apply two or more bias pulses substantially sequentially to each microbolometer in the array during a frame time;

a measuring circuit coupled to the array to measure two or more resulting signals associated with each of the applied two or more bias pulses during the frame time;

a computing circuit coupled to the measuring circuit to compute an average signal value for each microbolometer in the array from the measured two or more resulting signals during the frame time; and

an output circuit coupled to the computing circuit to produce an output signal based on the computed average signal value for each microbolometer in the array during the frame time.

15. (Previously Presneted) The apparatus of claim 14, wherein the output circuit further comprises:

an integrator and an A/D converter wherein said output signal produced is a digital signal value for each microbolometer in the array.

16. (Previously Presented) The apparatus of claim 15, further comprising:

a digital image processor, coupled to the output circuit to receive the digital signal value associated with each microbolometer of the array and correct the received digital signal value for image defects.

17. (Previously Presented) The apparatus of claim 16, wherein the digital image processor further comprises:

a correction circuit, to apply a corrective electrical signal based on a correction value to the output signal to correct for resistance non-uniformity in each microbolometer to obtain a uniform output signal value.

18. (Previously Presented) The apparatus of claim 17, wherein the correction circuit further corrects the uniform output signal value for fine offsets, gain non-uniformity, or dead pixels.

19. (Previously Presented) The apparatus of claim 18, wherein the digital image processor further comprises:

digital memories to store the correction values for each microbolometer in the array.

20. (Original) The apparatus of claim 14, wherein the two or more bias pulses are substantially equal in magnitude.

21. (Original) The apparatus of claim 20, wherein the two or more pulses are substantially equally spaced in time.

22. (Original) The apparatus of claim 14, wherein the two or more bias pulses are voltage bias pulses.

23. (Original) The apparatus of claim 22, wherein the resulting signals are current signals.

24. (Original) The apparatus of claim 14, wherein the two or more bias pulses are in the range of about 2 to 100 bias pulses.

25. (Original) The apparatus of claim 24, wherein the two or more bias pulses have time duration in the range of about 0.1 to 20 microseconds.

26. (Original) The apparatus of claim 14, wherein the frame time is the time it takes for the array to produce a complete image of an object being viewed by the array.

27. (Previously Presented) A signal processing electronics circuit for an array including one or more microbolometers, comprising:

a timing circuit coupled to the array to apply two or more bias pulses substantially sequentially to each microbolometer in the array such that the resulting temperature in each microbolometer in the array due to the application of the bias pulses is substantially uniform during a frame time;

a measuring circuit coupled to the array to measure two or more resulting signals, respectively associated with each of the applied bias pulses during the frame time;

a computing circuit coupled to the measuring circuit to compute an average signal value for each microbolometer in the array from the measured resulting signals during the frame time; and

an output circuit coupled to the computing circuit to produce an output signal based on the computed average signal value for each microbolometer in the array during the frame time.

28. (Canceled)

29. (Previously Presented) The circuit of claim 27, wherein the output circuit further comprises:

an integrator and an A/D converter wherein said output signal produced is a digital signal value for each microbolometer in the array.

30. (Previously Presented) The circuit of claim 29, further comprising:

a digital image processor coupled to the output circuit to receive the digital signal value associated with each microbolometer to correct for image defects such as fine offsets, gain non-uniformity or dead pixels.

31. (Previously Presented) The circuit of claim 30, wherein the digital image processor further comprises:

a correction circuit to apply a corrective electrical signal based on a correction value to the output signal to correct for any resistance non-uniformity in each microbolometer to obtain a uniform output signal value.

32. (Previously Presented) The circuit of claim 31, further comprising:

a memory to store the correction value associated with each microbolometer in the array.

33. (Previously Presented) The circuit of claim 27, wherein the two or more bias pulses are substantially equal in magnitude.

34. (Previously Presented) The circuit of claim 33, wherein the two or more bias pulses are substantially equally spaced in time.

35. (Previously Presented) The circuit of claim 27, wherein the two or more bias pulses are voltage bias pulses.

36. (Previously Presented) The circuit of claim 35, wherein the resulting signals are current signals.

37. (Previously Presented) The circuit of claim 27, wherein the two or more bias pulses are in the range of about 2 to 100 bias pulses.

38. (Previously Presented) The circuit of claim 37, wherein the two or more bias pulses have time duration in the range of about 0.1 to 20 microseconds.

39. (Previously Presented) The circuit of claim 27, wherein the frame time is the time it takes for the array to produce a complete image of an object being viewed by the array.